Treat manure as a nitrogen asset

Recent field trials underscore dairy manure's value as a nitrogen source, reducing reliance on commercial fertilizers.

by Alvaro Garcia

Manure is one of the largest nutrient resources available on many farms, yet its fertilizer value is often underestimated in nutrient management plans. When properly credited, manure can supply substantial nitrogen to crops while reducing reliance on commercial fertilizer.

Recent on-farm research conducted through the Cornell Nutrient Management Spear Program highlights the value of manure in corn production systems. Through the Value of Manure Project, scientists have been evaluating how manure contributes to crop nutrition under real farm conditions. Results from these trials show that dairy manure can significantly reduce fertilizer nitrogen requirements while maintaining or improving corn yields.

To evaluate manure performance under realistic conditions, researchers partnered with dairy farms across New York. Rather than using small research plots, the team established replicated strip trials within commercial corn fields.

These strips allowed researchers to compare areas receiving dairy manure with areas managed primarily with commercial fertilizer. In several fields, additional sidedress nitrogen fertilizer was applied to determine whether extra nitrogen improved crop performance following manure application.

This approach allowed the research team to evaluate manure performance across a wide range of soil types, weather patterns, and management practices typical of dairy farms.

Less nitrogen from fertilizer

Across multiple sites and growing seasons, manure consistently supplied nitrogen that supported crop growth. On average, corn fields receiving manure required approximately 20 to 25 pounds less fertilizer nitrogen per acre to achieve yields comparable to fields without manure. In several trials, applying additional fertilizer nitrogen after manure application did not significantly raise yields (see Table 1).

Figure 1. Corn yield response to manure and fertilizer nitrogen

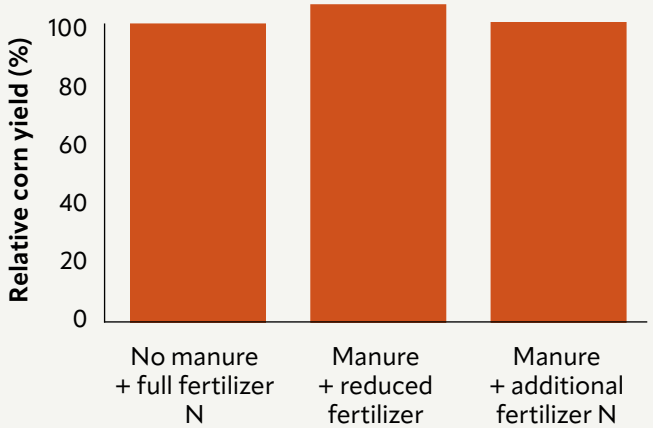

Figure 2. Estimated fertilizer value of dairy manure nutrients

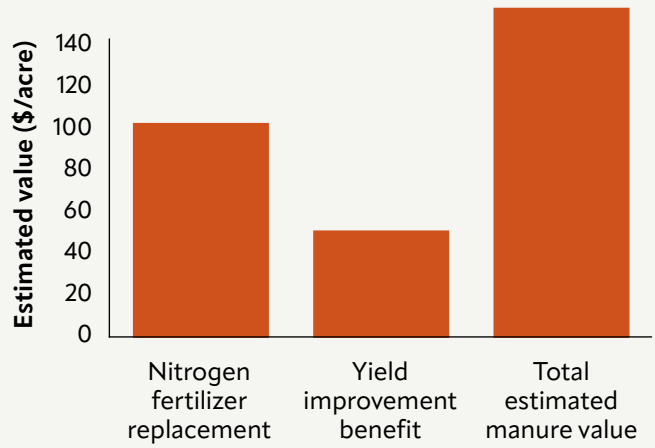

Table 1. Relative corn yield under manure and fertilizer treatments (e.g., bu/acre)

Treatment	Relative corn yield (%)
No manure and full fertilizer N	100
Manure and reduced fertilizer N	103 to 105
Manure and additional fertilizer N	101

Corn yield response to manure and fertilizer nitrogen rates in on-farm strip trials conducted by the Cornell Nutrient Management Spear Program.

Table 2. Estimated fertilizer value of dairy manure nutrients

Component	Value ($/acre)
Nitrogen fertilizer replacement	$90 to $110
Yield improvement benefit	$40 to $60
Total estimated manure value	$150+

Estimated economic value of dairy manure nutrients based on fertilizer savings and yield responses observed in on-farm corn trials.

These findings suggest that manure nitrogen contributions are sometimes greater than what is credited in nutrient management plans. Accurately accounting for manure nutrients can help farms avoid unnecessary fertilizer applications while improving nitrogen use efficiency.

In addition to reducing fertilizer needs, manure frequently supported strong crop yields. Some on-farm trials reported corn grain yield jumps of up to 30 bushels per acre compared with fields fertilized only with commercial nitrogen (see Figure 1).

These responses likely reflect the broader nutrient profile of manure. In addition to nitrogen, dairy manure supplies phosphorus, potassium, sulfur, and micronutrients. Manure also contributes organic matter to soil, which can improve soil structure, microbial activity, and water retention. These improvements can help crops perform better under variable weather conditions.

Beyond one season

Another important finding from the Value of Manure Project is that manure benefits often extend beyond the year of application.

Researchers observed that residual nitrogen and improved soil conditions sometimes supported crop growth during the following growing season. This carryover effect suggests that evaluating manure benefits over multiple years may provide a more accurate estimate of its overall nutrient contribution.

Recognizing these longer-term benefits can help nutrient planners make more effective fertilizer recommendations.

Crunching the numbers

When fertilizer savings and yield responses were considered together, manure delivered measurable economic benefits (see Table 2). Across the Cornell trials, manure nutrients were estimated to provide more than $150 per acre in value, not including manure handling or application costs (see Figure 2). The largest portion of this value came from reduced fertilizer purchases, while additional economic gains were associated with improved yields and better crop performance. As fertilizer prices fluctuate, maximizing manure nutrient use may help dairy farms reduce production costs while improving nutrient efficiency.

These results reinforce the importance of treating manure as a valuable fertilizer resource. Properly crediting manure nitrogen in nutrient management plans can help avoid unnecessary fertilizer applications while improving nitrogen use efficiency.

On-farm strip trials can also help farms evaluate fertilizer needs under their own soil and management conditions. Recognizing residual manure benefits and integrating manure into long-term fertility programs can further improve nutrient use.

Results from on-farm strip trials conducted through the Cornell Nutrient Management Spear Program show that manure often supplies sufficient nitrogen to reduce fertilizer rates without sacrificing corn yield. When fertilizer savings are combined with yield responses, manure nutrients provide meaningful economic value. Treating manure as a fertilizer asset and accurately crediting its nutrients in management plans can improve nitrogen efficiency while lowering crop production costs. ■

The author is a retired South Dakota State University professor. He is now a consultant with Dellait Animal Nutrition and Health.